AC 20-140C – Public Review Comment Matrix

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AIR-130	Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS)			

	Commenter	Section # and Page #	Comment	Suggested Change and Rationale	Disposition
1.	Airbus	§6.1.3.1, page 9	It is written 'The safety assessment in Appendix B of DO-350A/ED-228A indicates the inability to complete a LOGON is a minor safety effect.' But : -in DO-350A/ED-228A, the hazard 'inability to complete a LOGON' is not formally assessed. Only the 'loss of CPDLC capability' and the 'loss of ADS-C capability' are assessed, with a Severity Classification 'SC4' (i.e. Minor safety class). - From our perspective, the AC20-140C should not state the result of a safety assessment for the hazard 'inability to complete a LOGON'. This AC does not state/remind the result of the safety assessment performed in the SPR(s) for the CPDLC and ADS-C applications. The applicant has to perform the safety assessment of the aircraft datalink communication system considering as an input the applicable SPR. The safety effects (i.e. severity classifications) at	We propose to modify the paragraph §6.1.3.1 as follows 'The certification plan should define the design assurance method for the database (i.e., DO-178C or DO-200B) **in accordance** with the **safety effect of the** hazard ~~effect.~~ **'Inability to complete a LOGON' and considering the applicable SPR.** ~~The safety assessment in Appendix B of DO-350A/ED-228A indicates the inability to complete a LOGON is a minor safety effect.~~ We recommend you seek concurrence from the certification authority early in the program.'	Disagree. The effect is considered the same for "inability to complete a LOGON" and "Loss of CPDLC or ADS-C" for a single aircraft. Therefore, when the AC states the inability to complete a LOGON is a minor safety effect is based upon the safety assessment contained in DO-350A/ED-228A.

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			aircraft system level are the results of this safety assessment performed by the applicant. So, the AC20-140C should not anticipate the result of this assessment.		
2.	Airbus	§6.1.3.1 page 9	Considering the way the database is developed (e.g. development based on re-use and not from scratch), previous versions of the DO-178 and/or of the DO-200 might be used (e.g. DO-178B, DO-200A). Consequently, the DO-178C and DO-200B shouldn't be the only ones required by the AC20-140C.	Replaced (**i.e.,** DO-178C or DO-200B) by (**e.g.,** DO-178C or DO-200B) Or Remove (**i.e.,** DO-178C or DO-200B).	Disagree. FAA recognizes only DO-178C or DO-200B to be an acceptable means and it the responsibility of the applicant to propose an alternative means to gain airworthiness approval.
3.	Airbus	§6.1.3, page 9	This comment is about the last sentence of §6.1.3 *"To ensure interoperability, there should be no other data link communication system databases installed."* From our perspective, this sentence might be misleading as other database(s) related to data link communications are/can be installed without impact on interoperability. E.g. in Airbus aircraft there is a 'Customization database' which allows managing the configuration of the routing service(s) according to the	We propose to clarify or to delete the sentence 'To ensure interoperability, there should be no other data link communication system databases installed' Here is a proposal for clarification (if 'clarification' option retained): "Any other datalink system database installed should not impact the 'Logon' function	Agree. Modified the paragraph to indicate design assurance of any database within the data link communication system should provide database assurance

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			operator needs. But this database has no impact on/does not deal with the 'logon' interoperability aspect. So, when reading this sentence '*To ensure interoperability, there should be no other data link communication system databases installed*', we understand that, in addition to the datalink communication system database which contains the addressing information of ACCs (for logon purpose), other datalink system database(s) can be installed but there should not impact the 'Logon' interoperability.	interoperability"	
4.	Airbus	§6.1.4, Table-4 and Appendix A,Table-A1	The Table-4 includes Interop Criteria for Aircraft incorporating all Designators except B2a, whereas the Table-A1 includes Interop Criteria for Aircraft incorporating a B2a Designator. The Table-4 is in the main body of the document, whereas the table-A1 is in Appendix A. According to the Note in the §5.2.2 (page	Add all the Interop Designators and Criteria including B2 in the Table-4, and remove the Appendix A / Table A-1.	Disagree. Aviation community remains interested to settle on a converged B2 data comm system. Although DO-351A/ED-229A define two types of a B2 data comm systems; B2a is not a converged data comm system and unless SESARS'

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			3) we note that FAA considers 'acceptable' the B2a aircraft datalink system as the other datacomm systems identified in the Table 4. ("**Note:** Table 4 and Table A-1 identify interoperability requirements of the different data communication systems that the FAA considers acceptable for an applicant seeking a new, amended or supplemental type certification for an aircraft that supports ATS communication") Thus, as they are all considered as acceptable, the Interop Criteria for Aircraft incorporating B2a Designator should be included in the main body of the document (i.e. in Table-4) instead of being separated in a specific table located in an Appendix of the AC.		VLD or FAA's 4-DT demonstration determines a revision to the definition of B2b; B2b is anticipated to be the converged B2 data comm system. When this occurs Appendix A will be deleted and only Table 4 will exists to identify viable interop designators an applicant may seek for an airworthiness approval.
5.	Airbus	§6.2.2, Table-5	It is written in Table 5of §6.2.2 that for each RCP/RSP: 'Availability of an aircraft to use the service shall be 0.999 probability per flight hour. That is, the defined aircraft allocation in Table 5-14 / Table 6-14 shall be	Remove 'probability per flight hour' (6 occurrences in table-5)	Disagree. DO-306/ED-122 and PBCS Doc 9869 both currently specify the overall Availability and the aircraft allocated Availability is

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			$A_{Aircraft} = 0.999$.' The Availability is not a 'probability per flight hour'. It is only a 'probability' and so it is unitless. As an example, here is the definition of the RCP Availability (extract from PBCS and DO350A/ED228A) : " "A RCP parameter that specifies the required probability that an operational communication transaction can be initiated." The definition of RSP Availability is similar. In the DO350A/ED228A, it is added : 'It is the ratio between the time the system is actually available for service (MTBF) and the time the system is planned for service (MTTR + MTBF), i.e. Availability = MTBF/(MTTR+ MTBF)' The ratio of 'times' is unitless.		0.999. Although DO-350A/ED-228A specifies the overall Availability is 0.989 and the aircraft allocated Availability is 0.99; the FAA continues to view that 0.999 is correct. Until the debate occurs in OPLINK for PBCS and Global consensus is established to specify a different Availability the FAA will continue to view that the 0.999 value is correct.
6.	Airbus	§5.3 and Table-2 and Table-3 (pages 6 & 7)	According to the last sentence of §5.3, ie '*DO-350A/ED-228A defines communication and surveillance*	The content of Table-2 and Table-3 shall be aligned with SPR DO350A-ED228A, in	Disagree. DO-306/ED-122 and PBCS Doc 9869 both currently specify the overall

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			performance designators as shown in Table 2 and Table 3, which include the applicable safety criteria', we understand that the tables 2 and 3 are an extract from the DO350A / ED228A. But it is not true as, the Availability criteria values are different in these tables from the ones required in the DO350A/ED228A. Thus, the sentence is misleading.	particular for the Availability values. Modify the content of Tables 2 & 3 to be in line with DO350A-ED228A. See also next comment.	Availability and the aircraft allocated Availability is 0.999. Although DO-350A/ED-228A specifies the overall Availability is 0.989 and the aircraft allocated Availability is 0.99; the FAA continues to view that 0.999 is correct. Until the debate occurs in OPLINK for PBCS and Global consensus is established to specify a different Availability the FAA will continue to view that the 0.999 value is correct.
7.	Airbus	§6.2.2, Table-5	The Availability value (0.999) allocated to the aircraft system included in the Table-5 is not compliant with the Availability value (0.99) defined in the SPR DO350A/ED228A. The Availability value '0.99' was discussed and agreed within the WG78/SC214 group when the DO350/ED228 was established.	Align the Availability value in AC20-140C with the Availability value allocated to the aircraft system as defined in the SPR DO350A-ED228A.	Disagree. DO-306/ED-122 and PBCS Doc 9869 both currently specify the overall Availability and the aircraft allocated Availability is 0.999. Although DO-350A/ED-228A specifies the overall Availability is 0.989 and the

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			The 'historical' value '0.999' seems to come from the following calculation: according to the SPR DO306-ED122 Table5-9 and Table1-1, the 0.999 value seems to be justified by the calculation "$0.999=1-10^{-3}$", where 10^{-3} is '10^{-3} per flight hour' which comes from the classification 'Class 4' (Minor safety effect) of the hazard 'Loss of datalink capability, single aircraft'. As the 'Availability' is unitless, such calculation "1(unitless)-10^{-3}(per flight hour)" appears to be erroneous. As reminded in the DO350A-ED228A (Appendix D), Availability is the ratio between the time the system is actually available for service (MTBF) and the time the system is planned for service (MTTR + MTBF), i.e. Availability = MTBF/(MTTR+ MTBF)= 1/(1+MTTR/MTBF) Availability=f(MTBF, MTTR), it is not a characteristic intrinsic of a system but		aircraft allocated Availability is 0.99; the FAA continues to view that 0.999 is correct. Until the debate occurs in OPLINK for PBCS and Global consensus is established to specify a different Availability the FAA will continue to view that the 0.999 value is correct.

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			also depends on how it is used, serviced and maintained. When (MTTR/MTBF) is small compared to 1, it can be considered : Availability = 1/(1+MTTR/MTBF) ≈ 1-MTTR/MTBF = 1- λ*MTTR, where λ =1/MTBF (it is the failure rate of the system. When an aircraft system is considered, λ is its failure rate 'per flight hour') When considering an aircraft system failure rate of 10^{-3} per flight hour, which would be compliant with the classification 'Class 4' (Minor safety effect) of the hazard 'loss of datalink capability, single aircraft', it gives for the Availability allocated to the aircraft system, when driven by safety considerations: Availability =1- 10^{-3}*MTTR To be noted that MTTR is different between a short range aircraft and a long range aircraft (as MTTR depends on the		

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			Mean Flight Time (MFT) of the aircraft type considered).		
8.	Airbus	§7.1.5.1, page 15	Our understanding of the §7.1.5.1 of the AC20-140C and of the FAA Policy Memo PS-AIR-21.16-02 is that no special conditions or constraints for cybersecurity is required for the ATC datalink communications for all the Interop Designators listed in Table-4 and in Table-A1 (as they use governmental services or networks).	Please confirm our understanding of the §7.1.5.1	Agree. When cybersecurity is required for a data communication system; paragraph 7.1.5 will be revised to identify cybersecurity requirements in lieu of just identifying industry standards on cybersecurity.
9.	Airbus	§5.2.2 - Text below the Figure1 - Page4	Editorial : For FANS 1/A+ Interop Designator, in Note3 : replace "DO-352A / ED-229A" by "DO-352A / ED-**230**A" (two occurrences : one in the second bullet, one in the third bullet)	For FANS 1/A+, in Note3 : replace "DO-352A / ED-229A" by "DO-352A / ED-**230**A" (two occurrences : one in the second bullet, one in the third bullet)	Agree. Incorporated as suggested.
10.	Airbus	§5.2.2, Figure 1 (pages 3, 4, 5)	In the §5.2.2, it is written that FANS 1/A and FANS 1/A ADS-C designators are 'shown for historical purposes'. But, in the Figure 1, there are 'links' between the FANS 1/A a/c & FANS 1/A	Ensure consistency within the Figure 1 (figure and text) about the interoperability capabilities (or non-capabilities) between FANS	Agree. Removed the aircraft "FANS 1/A ADS-C" from Figure 1.

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			ADS-C a/c systems with ATN B1 ATSU and B2 ATSU. It does not seem consistent with the text below the Figure 1. Indeed, in the text below the Figure 1, the interoperability capability between such a/c systems (i.e. FANS 1/A and FANS 1/A ADS-C) and ATSU (i.e. ATN B1 and B2) is not quoted. Only the following interoperability capabilities related to FANS 1/A+ aircraft system are mentioned : - in the Note 4 of the Interop Designator FANS 1/A+ and in the Note 3 of the Interop Designator ATN B1, for the interoperability capability between FANS 1/A+ a/c system and ATN B1 ATSU - in the Note 5 of the Interop Designator FANS 1/A+ and in the Notes 1 of the Interoperability Designators B2a and B2b, for the interoperability capability between FANS 1/A+ a/c system and B2 ATSU	1/A & FANS 1/A ADS-C a/c systems and ATN B1 & B2 ATSU. E.g. remove these links in the figure if not necessary/appropriate for this AC.	

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11.	Airbus	§6.2.2, table 5, pages 13 and 14	Editorial: As mentioned in the § 5.1.1., the Performances designators should be identified in 'bold red text' in the §6.2.2, Table5 (first column)	Use 'bold red text' for the Performance Designators in the first column of the table 5 (in §6.2.2)	Agree. Incorporated as suggested.
12.	Airbus	§6, Table 4 and Table A1	For B2a and B2b interop designators : Satcom TSO and ARINC references do not allow ATN communication. As per today there is no ATN satcom network	For B2a and B2b: - remove satcom as a current viable network enabler or remove any reference to ARINC and TSO associated and leave it as a 'provision'	Agree. Incorporated as suggested.
13.	Airbus	§6, Table 4 and Table A1	For B2a and B2b interop designators, Satcom Iridium (SBD) was not considered as an enabler for B2 in opposite to SBB or Classic Aero. Why is it distinguished from the other satcoms?	Explain in table 4 and in table A1 why SBD is not a viable sub-network for B2a and B2b	Agree. SATCOM (SBD) has only been demonstrated as a viable subnetwork for RCP 240 and RCP 400 over the ACARS Network. AC 20-140 will recognize SATCOM (Classic Aero), SATCOM (SBB), and SATCOM (SBD) as viable subnetworks after they have been demonstrated.

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14.	Airbus	Appendix B, §B.3, page B-2	ARINC 761 is referenced, however ARINC 741P2-11 is sufficient as it defines the SATCOM interface with the CMU	Remove ARINC 761 from the ARINC Documents references	Agree. Incorporated as suggested.
15.	Airbus	§6 Table 4 and Table A1	For Satcom SBB and Satcom SBD, ARINC 741P2-11 is not mentioned whereas it is also applicable (as for the SATCOM Classic Aero)	In Table 4 and in table A1, add ARINC741P2-11 in the list of documents for SBB and SBD.	Agree. Incorporated as suggested.
16.	Textron Aviation	Table 4.1	Data link continues to need to be evaluated for a TSO. The lack of a TSO puts the earnest on the applicant to verify MOPS level requirements have been verified that we did not do the design work for and in the end we have to ask for our vendor to provide this data anyways.	Add a family of TSOs for the data link systems contained in this AC	Disagree. Industry has not developed standards for a data link article. Industry have developed requirements for a data link system only at an aircraft level and until industry defines the minimum performance standards (MPS) for an article that the FAA can use in a TSO; the FAA is unable to publish a TSO for a data link article.
17.	Textron Aviation	Table 4.1	By the look of all the added requirements to implement multiple systems ATN B1, FANS 1/A+, and ATN B2 makes it seem that ATN B2 systems are not backwards compatible with an ATN B1 system. As I		Disagree. An aircraft equipped with a B2 data communication system would also need to comply the accommodation interop

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			understood the intent of the working group that came up with the mops for ATN B2 an ATNB2 airplane should be able to operate on an ATNB1 network.		requirements to be capable of performing data communications with a FANS 1/A or ATN B1 ATSU. This was attempted to be explained in Section 5, Definitions for Different Types of Data Link System, of the AC. Interop Designator in the aircraft's flight manual identifies the aircraft capability.
18.	UASC	Section 2 Page 1	Flight Information Service (FIS) messages listed in this section indicate only D-ATIS is addressed but Table 4 includes standards references for ACARS ATS Departure Clearance, Oceanic Clearance and TWIP.	Expand FIS message list to also include ACARS ATS DCL, OCL and TWIP.	Agree. Incorporated as suggested.
19.	UASC	Section 5.1.2 Page 2	Doc 10037 edition 1 and 9869 edition 2 are not yet published.	Several options: refer to existing publications (e.g. GOLD edition 2); delay AC 20-140C release until the referenced ICAO documents are available; indicate what documents should be used until the ICAO documents are	Disagree. Paragraph 5.1.2 references ICAO PBCS, Doc 9869, and GOLD, Doc 10037 for information purposes. This AC does not identify any criteria from these publications to demonstrate as Means of

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				available.	Compliance. Sections 6, 7, 8 and 9 of the AC identify applicable criteria for that the applicant demonstrates for their approval.
20.	UASC	Figure 1 Page 3	Dual Stack system (that is, a system that supports both FANS 1/A+ and ATN B1) is not depicted in figure.	Expand text in 5.2.2 indicating both FANS 1/A+ and ATN B1 Application Interoperability Designators apply for aircraft that support both FANS 1/A+ and ATN B1 services.	Disagree. An aircraft equipped with FANS 1/A+ (with or without ATN B1 too) is identified as a FANS 1/A+ aircraft in Fig 1. Unique Interop designators for an aircraft equipped with multiple data comm systems. Furthermore, Paragraph 9.2 requires the aircraft's flight manual to indicate all of the data link types equipped on the aircraft and the operator is to identify in their flight plan the data comm systems their flight can perform (i.e. operator authorized to perform operator)
21.	UASC	Figure 1 Page 3	The relevance of the different colors of the lines connecting the aircraft to the ground ATSU is not defined.	Add a key identifying the relevance of the different colors.	Disagree. A line between the aircraft and ATSU indicates data communications can

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					occur. A different color is used for each type of ATSU capability (e.g. FANS 1/A+ ATSU uses a green line). Aircraft with different colors indicates an aircraft equipped with multiple capability (e.g. aircraft equipped with ATN B1 and FANS 1/A+ data comm systems).
22.	UASC	Figure 1 Page 5 B2b description	The US plans are mentioned but Europe's plans are not. Are ATC Winds services planned? If so, this service is missing from the list.	Add Europe's plans. Suggestion: SESAR JU plans to use B2b following completion of B2a VLD. Add ATC Winds if this service is also planned.	Disagree. Unaware of plans in Europe other than SESAR JU to use B2a in a Very Large scale Demonstration (VLD). Aviation community remains interested to settle on a converged B2 data comm system and unless SESARS' VLD or FAA's 4-DT demonstration determines a revision to the definition of B2b; B2b is anticipated to be the converged B2 data comm system. When this occurs Appendix A will be deleted

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					and only Table 4 will exists to identify viable interop designators an applicant may seek for an airworthiness approval.
23.	UASC	Table 4 Page 11 FANS 1/A+ criteria	There is no indication of action to take for UM83 uplink that contains a fix not in the active flight plan. There is no reference to guidance identifying the characteristics of route clearance uplink or active flight plan if demonstration of compliance to referenced CFRs is selected means of compliance.	Add UM83 guidance or indicate any implementation is acceptable. Provide reference, if one exists, to worst case route clearance uplink during flight (e.g. DO-290 Table 5-32) or provide reference to or define criteria.	Disagree. Industry consensus could not be achieved for how an aircraft behaves to a UM83 message; hence, flight crew is expected to manually resolve any discontinuity of the route from a UM83 clearance message.
24.	UASC	Section 7.2.3 Page 16	Datalink systems may have multiple layers of connections. Please clarify the definition of "connection failure" for purposes of indicating data link system failures to the flight crew.	Indicate application (e.g. CPDLC) connection failures.	Agree. Types of connections failures are not differentiated within the AC. However, the flight crew is expected to receive an indication when the aircraft system determines it can no longer send or receive data messages. Loss of comm example added to clarify the meaning of connection

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					failure.
25.	UASC	Section 7.3. Page 16	Table 4 defines VDL M0/A and VDL Mode2 to be separate subnetworks. Please clarify whether being able to activate or deactivate each sub-network means activating or deactivating the individual VHF modes or whether VHF is considered a single sub-network in this context.	Define subnetworks to be VHF, HF and/or SATCOM.	Agree. Added a note to help clarify when a multi-mode radio may need to be deactivated.
26.	UASC	Section 7.4. Page 17	Please clarify if "displaying messages with the same intent in the same way for all data link systems" is focused on the text of the message or the means of accessing the message or both. The question concerns installations that may support FANS in the FMS and ATN in the CMU. Do messages just need to look the same once displayed or does a common means of accessing the messages for display need to exist.		Disagree. Messages with the same message intent need to be displayed in the same manner. Displaying a message with the same intent differently lead to confusion to the flight crew.
27.	AH	Section 5.1.2 page 5	The reference to the SPR does not include the reference to the SPR for Oceanic and Remote Airspace, DO-306. It is incorrect, and unfair to change the standard to DO-350 (which carries a	In the sentence that refers to the basis for performance requirements, include DO-306 to ensure that FANS 1/A retrofit STC's have the same	Disagree. The safety/performance assessment in DO-350A/ED-228A was an assessment that was agnostic to the data

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			more strict set of requirements) for retrofit STC's of FANS 1/A (only) aircraft to meet a higher bar than aircraft that are currently flying in FANS airspace.	standard that all of the existing FANS 1/A implementation were based on for safety and performance requirements.	comm system. The assessment was developed to describe the effect of an operation independent of the technology (e.g. ATN B1, FANS 1/A+ or B2a/B2b). The assessment developed in DO-350A/ED-228A used the assessment in DO-306/ED-122 plus lessons learned since that assessment was developed. Therefore the assessment in DO-350A/ED228A may be used for any data communication system that is used to support the operation being assessed to describe the operational effect.
28.	AH	Figure 1 page 7	Clarify that Notes 2 and 3 do not apply to FANS 1/A aircraft. The notes 2 and 3 only apply to dual-stacked aircraft. At present, the notes 2 and 3 give the impression that the GROUND facilities will provide seamless transition to FANS 1/A equipped aircraft. Presently,	Either: 1) Change column to the left of the notes to state "FANS 1/A dual stacked with ATN B1" Or 2) Add parenthetical at	Disagree. Figure 1 describes the interoperability of an aircraft Interop Designator communicating to an ATSU Interop Designator. The notes requesting clarification, clearly

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			applicants of FANS 1/A (single stack) aircraft will understand that the ground will seamlessly transition their aircraft to ATN B1 (with no change to aircraft equipment.) This is not correct, and will cause confusion to operators and applicants.	the end of each of notes 2 and 3 stating: (This note does not apply to FANS 1/A single stack aircraft.)	indicates in the note when seamless transitions could occur.
29.	AH	Section 6.1.2 page 11	The first sentence: "the interoperability criteria in each row of Table 4 (or Table A-1) are applicable in their entirety to the aircraft data link system for the row (capabilities and subnetworks selected. To meet CFR … aircraft data link systems must comply with all the referenced criteria in a row in order to receive the associated interoperability designator." This statement is not true, and needs to be modified. The FANS 1/A row includes HFDL which is not required anywhere for FANS 1/A operations. It is also not required that a FANS 1/A implementation support both Inmarsat and Iridium SATCOM. It is also not required that a FANS 1/A	In Table 4, for the designator "FANS 1/A" in the far right hand side, under the subnetwork designators detail, change the statement "viable subnetworks associated with FANS 1/A+" to "choices of subnetworks for support of FANS 1/A+:"	Disagree. Each Interop designator includes a list of Sub-Networks that are viable for a specific Interop Designator. The word "viable" would be deleted to list sub-networks for each interop designator if they were all required for the Interop Designator that is being defined in Table 4.

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			implementation support both VDLM0/A and VDLM2. Thus these requirements are not required in their entirety.		
30.	AH	Section 9.1 page 21	"Operating Limitation" section is missing a warning about the interference issue for an aircraft implementing both Inmarsat and Iridium systems on the same aircraft. The industry is well aware of the potential for hazardous interference from an Inmarsat SATCOM system into an Iridium SATCOM system that cannot be overcome by the use of filters, and therefore, any applicant who intends to use an Iridium SATCOM system for safety services under this AC needs to provide an operational limitation, or define their EMC interference mitigation method.	Add subsection to 9.1 stating the following: "applicants who are installing an Iridium SATCOM system for safety services on an aircraft with a new or existing Inmarsat SATCOM system should provide the operational limitation or define the automatic means of mitigating all potential EMC interference from the Inmarsat SATCOM into the Iridium SATCOM.	Agree. Added a note to Paragraph 8.2 to have applicant evaluate EMC when aircraft is equipped with a Inmarsat and Iridium Satellite Systems.
31.	Garmin	General	AC 20-146C has substantially increased the use of "must" and "shall" from that of AC 20-146B, but the increased use of the verb "must" within this draft AC does not always appear to be based on clear regulatory requirements. FAA Order 1320.46D, *FAA Advisory Circular System*, is applicable to "…anyone who prepares and issues ACs" (ref. Chapter 1 paragraph 2). Order 1320.46D Chapter 3 paragraph 7.f states:	In accordance with OMB *Good Guidance Practices* (GGP) Section II.2.g and Order 1320.46D Chapter 3 paragraph 10.a, which states: "a. Place references in the text where they will be most useful" it is suggested to include all regulatory requirement references	Agree. Paragraph 1.3 has been added to define when a requirement in this AC is driven by regulation whereas the term should is used to indicate a recommend criterion in this AC and not a requirement in this AC. The

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			"f. Use "must" to convey regulatory requirements. … "Must" clearly conveys a requirement." The Office of Management and Budget (OMB), *Bulletin for Agency Good Guidance Practices* (72 FR 3432), Section II.2.g and II.2.h further clarify that (emphasis added; *italics* in original): "2. *Standard Elements:* Each significant guidance document shall: … g. Include the citation to the statutory provision or regulation (in Code of Federal Regulations format) which it applies to or interprets; and h. Not include mandatory language such as "shall," "must," "required" or "requirement," unless the agency is using these words to describe a statutory or regulatory requirement, …" (Note: These OMB *Bulletin for Agency Good Guidance Practices* principles are acknowledged by FAA Order 8100.16 Chapter 2 paragraphs 2-2 and 2-2.c.)	where the AC is using "must" to convey a regulatory requirement. Such references will enable the reader to connect the appropriate regulatory requirement and to indicate the basis for the AC using the verb "must". In accordance with OMB GGP Section II.2.h, if a clear regulatory requirement cannot be referenced, change "must" to "should". An example paragraph where the regulatory basis for using the word "must" is not readily apparent but not necessarily limited to (emphasis added): • 9.2.2: "Because the interop designator for FANS 1/A+ does not clarify if the implementation supports automation capability defined in Table 4 (e.g. avionics ability to load routes into the flight management system in lieu of manual entry by the flight crew), FANS 1/A+ data link types must indicate either FANS 1/A+ (with automation) or FANS 1/A+ (without	two examples Garmin provided in the comment are not good examples since both of the examples are associated with a requirement (i.e. must) that is driven by 2x.1583 "Kinds of Operation" to identify in the Flight Manual what kind of data comm system the aircraft is equipped with and the operator may file in their flight plan for the ANSP to use for Air Traffic Management..

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				automation)." • 9.2.3: If the FAA approves variations to the criteria contained in this AC and these variations impact operational use of the data link system, the A/RFM must also include additional information that describes the operational impact. Additional specific comments on other instances of "must" are provided below.	
32.	Garmin	General	The terms "must" and "should" are both used in this AC but they are not defined. Definitions should be added to this AC to provide clarity as to their specific meaning.	With respect to the definitions of "must" and "should", we recommend use of the text in the table included as an attachment at the end of the comment log table. We further recommend that the FAA standardize inclusion of these definitions within all ACs via an update to Order 1320.46D.	Agree. Paragraph 1.3 has been added to define when a requirement in this AC is driven by regulation whereas the term should is used to indicate a recommend criterion in this AC and not a requirement in this AC. Also added the following sentence "Since this AC represents an accepted means of compliance, an applicant seeking an alternative to any requirement or recommendation within this

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					AC will need to be discussed with the ACO in order to achieve a common performance level with the AC."
33.	Garmin	Pg. 8, Sec. 6.1.2	The paragraph references 23.1301(a). The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1315. Publication of final rules is expected this year.	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1315 (more than one location).	Disagree. Reference to 23.1315 in lieu of 23.1301 and 23.1309 will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
34.	Garmin	Pg. 8, Sec 6.1.2	The paragraph, Note 1, states "For a multiple capability – aircraft configuration, the system must include the message set for each data link type the aircraft data link communication system supports." The use of "must" within a note is confusing and should not be used to indicate a requirement in the AC.	Remove the "must" from the note. Any AC requirement should be identified in the AC's body text and notes should only be used as supporting text.	Agree. Note has been revised without the term "must" in the note.
35.	Garmin	Pg, 9, Sec. 6.1.3	The paragraph states, in part, "To ensure interoperability, there should be no other data link communication system databases installed." The intent of this sentence is not clear. Is the text attempting to state that there should be one canonical source of ACC addressing information?	Update the text to clarify intent.	Agree. Modified Paragraph 6.1.3 to indicate that any database (within the data link communication system) should provide database

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					assurance.
36.	Garmin	Pg. 9, sec. 6.1.3.1	The paragraph states, in part, "The safety assessment in Appendix B of DO-350A/ED-228A indicates the inability to complete a LOGON is a minor safety effect. We recommend you seek concurrence from the certification authority early in the program." The wording implies the specified hazard level in DO-350A may not be sufficient.	Clarify circumstances under which the hazard level in DO-350A is insufficient to more easily allow applicants to either adjust their design or ensure they have sufficient design assurance.	Agree. Revised sentence to indicate how the safety assessment in DO-350A/ED-228A may be a useful tool for an applicant
37.	Garmin	Pg. 9, Sec. 6.1.4	The paragraph states, in part, "Operational standards are needed to ensure transfer of CPDLC connections between ATSUs with different data link systems." The phrase "operational standards" is unclear. Flight crew procedures may be necessary to manually log off one type of system and log on to another.	Change "operational standards" to "operational procedures" or "flight crew procedures"	Agree. Modified as suggested.
38.	Garmin	Pg. 11, Table 4	The text references "2X.771(a)" in two places. The published NPRM for Part 23 (81 FR 13452) eliminates 23.771.	Depending on the publication date for this AC, it may be appropriate to replace the reference with 23.1500.	Disagree. Reference to 23.1500 in lieu of 23.771 will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
39.	Garmin	Pg. 11, Table 4	The text references "2X.1523" in two places. The published NPRM for Part 23 (81 FR 13452) eliminates 23.1523.	Depending on the publication date for this AC, it may be appropriate to replace the reference with 23.1505.	Disagree. Reference to 23.1505 in lieu of 23.1523 will occur in the next

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					revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
40.	Garmin	Pg. 11, Table 4	The text references only TSO-C159c for "Satcom (SBD)." Iridium SBD capable LRUs may use earlier versions of TSO-C159. Note that the "VDL M2" subnetwork class allows "TSO-C160 or TSO-C160a."	Update with earlier versions of TSO-C159 permitted for Iridium SBD capable LRUs.	Disagree. Hesitant to recognize earlier versions of TSOs since they are used as building blocks for aircraft airworthiness approvals. The AC was revised to recognize only TSO-C160A for the VDL M2 sub-network to ensure any new airworthiness approvals with VDLM2 radios will include multi-channel capability. Applicant may continue to seek aircraft airworthiness approvals using an earlier TSO version with an equivalent level of safety (ELOS).
41.	Garmin	Pg. 13, sec. 6.2.1	The paragraph references 23.1309(a). The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1315. Publication of final rules is	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1315 as applicable.	Disagree. Reference to 23.1515 in lieu of 23.1309(a) will occur in the next

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			expected this year.		revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
42.	Garmin	Pg. 13, sec. 6.2.2	The paragraph references 23.1309(d). The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1315. Publication of final rules is expected this year.	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1315 as applicable.	Disagree. Reference to 23.1515 in lieu of 23.1301 and 23.1309(a) will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
43.	Garmin	Pg. 14, sec. 6.2.2	The paragraph references 23.1301(a). The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1315. Publication of final rules is expected this year.	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1315 as applicable.	Disagree. Reference to 23.1515 in lieu of 23.1301 and 23.1309(a) will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
44.	Garmin	Pg. 15, sec. 7.1.5	The purpose of this AC states, "This AC provides guidance material for applicants seeking an airworthiness approval for aircraft with an installed data link system intended to support air traffic services (ATS) data communication." Services such as ACARS	Per the currently published policy statement, special conditions will not be applied to ATS systems running over ACARS. Security for the ACARS link itself cannot be applied only at the aircraft level –	Disagree. Paragraph 7.1.5 and its sub paragraphs do not require or recommend an applicant to comply with any criteria associated with

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			ATS and FANS 1/A require the use of the ACARS network to operate. Policy Statement PS-AIR-21.16-02 states, in part, "This policy statement does not require the issuance of special conditions for airworthiness and operational approval of… the Aircraft Communications Addressing and Reporting System (ACARS)." Further, the policy statement only requires issuance of a special condition if, "[t]he external service or network is non-governmental." The FAA ARAC tasked the ASISP working group with recommending updates to regulations to address security. Refer to 80 FR 5880-5882. The ASISP working group's report is due in August 2016, and is expected to contain recommendations on a variety of topics related to ASISP.	interoperability standards must be developed and applied. It is recommended to remove section 7.1.5 and its sub-sections. Await the publication and acceptance of the ARAC ASISP WG report prior to including any security guidance in this or any other AC.	cybersecurity for any type of data communications system. Cybersecurity of data messages is important to the aviation community and the standards for an ATN IPS network are considering cybersecurity in their development effort. The intent of adding Paragraph 7.1.5 and it subparagraphs is to confirm to the Aviation Community the importance of cybersecurity with data communications.
45.	Garmin	Pg. 15, sec. 7.1.5.1	The FAA ARAC tasked the ASISP working group with reviewing policy (including PS-AIR-21.16-02). Refer to 80 FR 5880-5882. The ASISP working group's report is due in August 2016, and is expected to contain recommendations to revise the policy statement.	Await the revision of the policy statement prior to referencing it from this or any other AC.	Disagree. Paragraph 7.1.5 and its sub paragraphs do not require or recommend an applicant to comply with any criteria associated with cybersecurity for any type of data communications system. Cybersecurity of data messages is important to the aviation community and the

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					standards for an ATN IPS network are considering cybersecurity in their development effort. The intent of adding Paragraph 7.1.5 and it subparagraphs is to confirm to the Aviation Community the importance of cybersecurity with data communications.
46.	Garmin	Pg. 15, sec. 7.1.5.2	RTCA DO-326A is not applicable to some aircraft covered by the regulatory references. DO-326A section 1.2, "Scope" states in part, "…in the context of part 25 Transport Category Aircraft which include an approved passenger seating configuration of more than 19 passenger seats. This guidance is not intended for CFR parts 23, 27, 29, 33.28 and 35.15, normal, utility acrobatic and commuter category airplanes, normal category rotorcraft, transport category rotorcraft, engines and propellers."	Remove the reference to RTCA DO-326A.	Disagree. Paragraph 7.1.5 and its sub paragraphs do not require or recommend an applicant to comply with any criteria associated with cybersecurity for any type of data communications system. Cybersecurity of data messages is important to the aviation community and the standards for an ATN IPS network are considering cybersecurity in their development effort. The intent of adding Paragraph 7.1.5 and it subparagraphs is

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					to confirm to the Aviation Community the importance of cybersecurity with data communications.
47.	Garmin	Pg. 15, sec. 7.1.5.3	RTCA DO-355 is not intended to be used outside the scope of a DO-326A compliant process.	Remove the reference to RTCA DO-355.	Disagree. Paragraph 7.1.5 and its sub paragraphs do not require or recommend an applicant to comply with any criteria associated with cybersecurity for any type of data communications system. Cybersecurity of data messages is important to the aviation community and the standards for an ATN IPS network are considering cybersecurity in their development effort. The intent of adding Paragraph 7.1.5 and it subparagraphs is to confirm to the Aviation Community the importance of cybersecurity with data communications.
48.	Garmin	Pg. 15, sec. 7.1.5.4	RTCA DO-356 is not applicable to some aircraft covered by the regulatory references. DO-326A	Remove the reference to RTCA DO-356.	Disagree. Paragraph 7.1.5 and its sub paragraphs do not

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			section 1.2, "Scope" states in part, "…in the context of part 25 Transport Category Aircraft which include an approved passenger seating configuration of more than 19 passenger seats. This guidance is not intended for CFR parts 23, 27, 29, 33.28 and 35.15, normal, utility acrobatic and commuter category airplanes, normal category rotorcraft, transport category rotorcraft, engines and propellers." Furthermore, DO-356 is not harmonized with EUROCAE ED-203. Harmonization work is ongoing and is the subject of the latest TOR for RTCA SC-216.		require or recommend an applicant to comply with any criteria associated with cybersecurity for any type of data communications system. Cybersecurity of data messages is important to the aviation community and the standards for an ATN IPS network are considering cybersecurity in their development effort. The intent of adding Paragraph 7.1.5 and it subparagraphs is to confirm to the Aviation Community the importance of cybersecurity with data communications.
49.	Garmin	Pg. 15, sec. 7.2	The paragraph references 2X.1322. The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1305(b) and (c). Publication of final rules is expected this year.	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1305 as applicable.	Disagree. Reference to 23.1505 in lieu of 23.1301 and 23.1309 will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.

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50.	Garmin	Pg. 16, sec. 7.3	The paragraph references 23.1309(d). The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1315. Publication of final rules is expected this year.	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1315 as applicable.	Disagree. Reference to 23.1515 in lieu of 23.1301 and 23.1309 will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
51.	Garmin	Pg. 17, sec. 7.4	The paragraph references 23.1309(d). The published NPRM for Part 23 (81 FR 13452) eliminates 23.1301 and 23.1309 and replaces them with 23.1315. Publication of final rules is expected this year.	Depending on the publication date for this AC, it may be appropriate to update the AC with references to 23.1315 as applicable.	Disagree. Reference to 23.1515 in lieu of 23.1301 and 23.1309 will occur in the next revision of this AC because publication to the amendment of Part 23 regulations will occur after AC 20-140C is published.
52.	Nick Hendrickson (FLYHT)	Section 6.1.4 Page 11 Table 4	Viable sub-networks associated with FANS 1/A+: 6) SATCOM (SBD) a) TSO-C159c for Equipment Class in Table 1A.	Change to: "a) TSO-C159b or later for Equipment Class in Table 1A." The current wording does not allow for certifications under the current TSO-C159b to be used as a means of compliance. Some products have been certified under	Disagree. Hesitant to recognize earlier versions of TSOs since they are used as building blocks for aircraft airworthiness approvals. The AC was revised to recognize only TSO-C160A for the VDL M2 sub-network to ensure any new airworthiness approvals with

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				TSO-C159b, and this certification should still be applicable. The draft TSO-C159c requires equipment to meet the MPS in RTCA/DO-262B including Change 1. The current TSO-C159b references RTCA/DO-262B prior to Change 1. Change 1 was introduced to correct errors in DO-262B, and does not materially affect the functionality of qualified equipment.	VDLM2 radios will include multi-channel capability. Applicant may continue to seek aircraft airworthiness approvals using an earlier TSO version with an equivalent level of safety (ELOS).
53.	Boeing	General Comment	We propose to include "SATCOM Iridium (Certus)" to the list of Sub-network Designators within Table 1, page 6, and to Table 4, page 11. We propose adding SATCOM Iridium (Certus) to available Sub-network designators and invocation of TSO standard (i.e. TSO C-159(d)) since SATCOM Iridium (Certus) will be in-service shortly after the release of AC 20-140C, and is planned for installation on commercial aircraft.		Disagree. Industry standards associated using the Iridium Next Network and Certus Services using the Iridium Next Network has not been developed yet. After these standards have been published and communication/surveillance performance that is being

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					sought will allow us to determine if a new subnetwork designator needs to be established. If SATCOM (SBD) remains the designator for ATS data messages going over the Iridium Next Network then interoperability will be demonstrated including the communication/surveillance performance being sought. All of this effort will be performed and reflected in the next revision to this AC.
54.	Boeing	Page 1 Para 4.1	"This revision of the AC adds airworthiness approval guidance for a "Baseline 2" data communications system. There are currently two versions of Baseline 2, B2a and B2b. Operators will need to equip with version B2b to conduct future NextGen operations in the U.S. National Airspace System (NAS) including Interval Management (IM) and Dynamic Required Navigation Performance (DRNP)." Information is provided for one version of B2, similar information should be provided for the	The NAS will require B2b; we suggest including clarification for the uses of B2a, and whether or not it can also be used with NAS with limited capabilities.	Disagree. Paragraph 4.1 indicates that aircraft will need to equip their aircraft with version B2b to conduct future operations in the US National Airspace System (NAS). FAA currently plans to provide data services only to B2b equipped aircraft in the future; however, FAA may adjust that plan when

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			other version of B2.		"Advanced Services" for Segment 2 is baselined in 2024.
55.	Boeing	Page 2 Para 5.1.2	"The RCP/RSP specifications are based on RTCA DO-350A/EUROCAE ED-228A, Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard). The guidance in this AC is compatible with GOLD and PBCS." The current GOLD and PBCS do not cover B2 standard.	~~"The RCP/RSP specifications are based on RTCA DO-350A/EUROCAE ED-228A, Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard). The guidance in this AC is compatible with GOLD and PBCS."~~	Disagree. The safety/performance requirements in DO-350A/ED-228A does not conflict with the set safety/performance requirements in ICAO GOLD, Doc 10037, or PBCS, Doc 9869. Furthermore, Paragraph 5.1.2.2 indicates future amendments to these manuals are planned to include provisions for B2a and B2b. DO-350A/ED-228A will be revised if necessary after this work in ICAO has been accomplished to harmonize the set of Safety/Performance requirements in RTCA, EUROCAE, and ICAO

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					material.
56.	Boeing	Page 3 Para Figure 1	The diagram appears to indicate that the B2a, B2b and ATN B1 ATSUs would provide interoperability with FANS-1/A, ATN B1 and B2 aircraft. Unclear, and potentially misleading information.	Revise the diagram to show that B2a and B2b would only provide interoperability with B2 aircraft and ATN B1 would only provide interoperability with ATN B1 aircraft.	Agree. Modified Figure as suggested.
57.	Boeing	Page 10, Table 4 Para B2b, Sub-Network Designator(s)	Viable sub-networks associated with B2b 1) VDL M2 a) TSO-C160 or TSO-C160A for (Class X) or (Class Z and Y) b) ARINC 631-6 ~~2) SATCOM (Classic Aero)~~ ~~a) TSO-C132a~~ ~~b) ARINC 618-7, Section 7~~ ~~c) ARINC 741P2-11, Section 3.2, 3.6, 4.2 and Attachment 2F-44.~~ ~~3) SATCOM (SBB)~~ ~~a) TSO-C159c for Equipment Class in Table 1B.~~ Industry definition currently only supports VDLM2 sub-networks designator.		Agree. Modified as suggested.

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58.	Boeing	Page 17 Para 7.5	You can use printers to retain data communication messages sent or received during a flight; however, you should not use the printer to verify CPDLC messages. Flight crew should be able to use print out for verification purposes,	~~You can use~~ Printers **can be used** to retain data communication messages **and print out messages** sent or received during a flight; however, you should not use the printer to verify CPDLC messages.	Agree. Modified with slightly different text but captured the spirt of the comment.
59.	GE	Page 1 Para 1.2	Please define what it means to follow this AC in all "important respects"	Either provide a definition of "important respects" or, instead, call out the specific paragraphs that must be followed. Rationale: It is not clear what "important respects" means in this context.	Agree. Modified the phrase "all important respects" to "its entirety".

AC 20-140C – Public Review Comment Matrix

Originating Office:	Document Description:	Project Lead/Reviewer	Reviewing Office:	Date of Review:
AIR-130	Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS)			

Attachment Referenced in Garmin's Comment #2

Table 1 - Definition of Terms

Terminology	Meaning	Functional Impact
Must	Indicates a mandatory requirement driven by regulation that is to be followed when using the guidance in this AC	Alternative means of compliance has to be accepted by the FAA
Should	Indicates a recommendation and not a requirement when using the guidance in this AC	None, because it is optional